WEST ATCHAFALAYA BASIN PROTECTION LEVEE BORROW PIT CANAL TMDL FOR DISSOLVED OXYGEN

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SUBSEGMENT 060211

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources (NPS) discharging to the waterbody. This report presents a TMDL that has been developed for dissolved oxygen (DO) for subsegment 060211 in the Vermilion-Teche basin in southern Louisiana.

Subsegment 060211 includes the West Atchafalaya Basin Protection Levee (WABPL) Borrow Pit Canal from Bayou Courtableau to Henderson, LA. During low flow conditions, most of the flow in this portion of the borrow Pit Canal is upstream inflow from Bayou Courtableau. Flow from Bayou Courtableau into Borrow Pit Canal is controlled by two weirs and by two control structures operated by the Teche-Vermilion Fresh Water District. The predominant land use in this subsegment is agriculture. There are a few small point source discharges in this subsegment.

This subsegment was listed on the Modified Court Ordered 303(d) List for Louisiana as not fully supporting the designated use of propagation of fish and wildlife and was ranked as priority #1 for TMDL development. It was not included on the 1998 303(d) List, but was later added to the list based on LDEQ assessment data collected during June through December 1998. The causes for impairment cited in the 303(d) List included organic enrichment/low DO. The water quality standard for DO is 5 mg/L year round.

A water quality model (LA-QUAL) was set up to simulate DO, CBOD, ammonia nitrogen, and organic nitrogen. The model was calibrated using LDEQ assessment data collected during June through December 1998, data from FTN's synoptic survey in September 2000, and other information obtained from LDEQ, Corps of Engineers, and USGS. There were no intensive survey data available for this subsegment. The projection simulation was run at critical flows and temperatures to address seasonality as required by the Clean Water Act. Reductions of existing

NPS loads were required for the projection simulation to show the DO standard of 5 mg/L being maintained. In general, the modeling in this study was consistent with guidance in the Louisiana TMDL Technical Procedures Manual.

A TMDL for oxygen demanding substances (CBOD, ammonia nitrogen, organic nitrogen, and sediment oxygen demand) was calculated using the results of the projection simulation. Both implicit and explicit margins of safety were included in the TMDL calculations. The TMDL includes wasteload allocations (WLAs) for all of the point sources with minor oxygen demanding discharges. Nonpoint source reductions of 15% to 25% are required for the subsegment to meet the water quality standard for DO.

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1.0 INTRODUCTION

This report presents total maximum daily loads (TMDLs) for dissolved oxygen (DO) for subsegment 060211. This subsegment was listed on the February 29, 2000 Modified Court Ordered 303(d) List for Louisiana (EPA 2000a) as not fully supporting the designated use of propagation of fish and wildlife. It was not included on the 1998 303(d) List (LDEQ 1998), but was later added to the list based on LDEQ assessment data collected during June through December 1998. The suspected sources and suspected causes for impairment in the 303(d) List are included in Table 1.1. This subsegment was ranked as priority #1 for TMDL development. The TMDL in this report was developed in accordance with Section 303(d) of the Federal Clean Water Act and EPA's regulations at 40 CFR 130.7. The 303(d) Listings for other pollutants in this subsegment are being addressed by EPA and the Louisiana Department of Environmental Quality (LDEQ) in other documents.

The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant and to establish the load reduction that is necessary to meet the standard in a waterbody. The TMDL is the sum of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The WLA is the load allocated to point sources of the pollutant of concern, and the LA is the load that is allocated to nonpoint sources (NPS). The MOS is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and future growth.

Table 1.1. Summary of 303(d) listing for subsegment in the 060211 (EPA 2000a).

Subsegment Number	Waterbody Description	Suspected Sources	Suspected Causes	Priority Ranking (1 = highest)
060211	West Atchafalaya Borrow Pit Canal from Bayou Courtableau to Henderson, LA, including Bayou Portage	Minor municipal point sources Package plants (small flows) Non-irrigated crop production Septic tanks	Suspended solids Turbidity Salinity/TDS/chlorides/sulfates Organic enrichment/low DO	1

2.0 STUDY AREA DESCRIPTION

2.1 General Information

Subsegment 060211 includes the West Atchafalaya Basin Protection Levee (WABPL) Borrow Pit Canal from Bayou Courtableau to Henderson, LA just south of Interstate 10 (see Figure A.1 in Appendix A). The Borrow Pit Canal is a man-made waterbody that was created when earthen material was excavated to build the WABPL. The Borrow Pit Canal follows the west side of the WABPL. The WABPL forms the eastern boundary of the subsegment. Land use data for the subsegment is shown in Table 2.1.

Table 2.1. Land uses in the study area based on GAP data (USGS 1998).

Land Use Type	% of Total Area
Fresh Marsh	0.5%
Saline Marsh	0.0%
Wetland Forest	10.1%
Upland Forest	0.4%
Wetland Scrub/Shrub	0.4%
Upland Scrub/Shrub	0.1%
Agricultural	79.5%
Urban	3.6%
Barren	0.0%
Water	5.4%
TOTAL	100.0%

Although the Borrow Pit Canal receives runoff from land within the subsegment, most of the flow in this portion of the borrow Pit Canal during low flow conditions is upstream inflow from Bayou Courtableau. Flow from Bayou Courtableau into the Borrow Pit Canal is controlled by two weirs and by two control structures operated by the Teche-Vermilion Fresh Water District (see Figure A.2). Water is pumped westward from the Atchafalaya River through the WABPL, where it then flows southward into Bayou Courtableau. Most of this water in Bayou Courtableau flows west and then south into Bayou Teche for use as irrigation water in the Bayou Teche and Vermilion River basins. However, some of the water in Bayou Courtableau flows through the Bayou Courtableau-Borrow Pit control structure into the Borrow Pit Canal. The Courtableau Weirs also allow water to flow from Bayou Courtableau into the Borrow Pit Canal, but only during high flow conditions. Additional information on the regulation of flows and operation of control structures in this area is provided in the Corps of Engineers Water Control Plan (USACE 1998).

2.2 Water Quality Standards

The numeric water quality standards and designated uses for subsegment 060211 are shown in Table 2.2. The primary numeric standard for the TMDL presented in this report is the DO standard of 5 mg/L year round.

Table 2.2. Water quality standards and designated uses (LDEQ 2000a).

Subsegment Number	060211
Waterbody Description	West Atchafalaya Borrow Pit Canal
Designated Uses	ABC
Criteria:	
Chloride	40 mg/L
Sulfate	30 mg/L
DO	5.0 mg/L (year round)
pH	6.0 – 8.5
Temperature	32 °C
TDS	220 mg/L

USES: A – primary contact recreation; B – secondary contact recreation; C – propagation of fish and wildlife; D – drinking water supply; E – oyster propagation; F – agriculture; G - outstanding natural resource water; L – limited aquatic life and wildlife use.

2.3 Identification of Sources

2.3.1 Point Sources

A list of NPDES permits that were identified in or near the study area is included in Appendix B. These permits were identified by searching two sources of information. The primary source was a listing of all the permits in the Vermilion-Teche basin (basin number 06) from the LDEQ static database. The secondary source was a listing of all the permits in the Vermilion-Teche basin (hydrologic units 08080102 and 08080103) from EPA's Permit Compliance System (PCS) on the EPA website. All of the information concerning permit parameters and design flow in Appendix B was obtained by manually retrieving hard copies of permit files from LDEQ's file room.

Facilities without oxygen demanding parameters in their permit were assumed to exert a negligible oxygen demand in the receiving stream; therefore, these facilities were excluded from any further consideration in this TMDL. All of the facilities with oxygen demanding parameters in their permit were included in the TMDL calculations, but none of them was considered large enough to be modeled explicitly. The oxygen demanding discharges were included in the TMDL by adding their oxygen demand to the total loading simulated in the model.

2.3.2 Nonpoint Sources

Several NPS were cited as suspected sources of impairment in the 303(d) List (Table 1.1). These NPS include non-irrigated crop production and septic tanks.

2.4 Previous Data and Studies

Listed below are previous water quality data and studies in or near the study area. The location of the LDEQ ambient monitoring station is shown in Appendix A.

1) Twice monthly data collected by LDEQ for "West Atchafalaya Borrow Pit Canal" (station 671) for mid-June to December 1998.
2) West Atchafalaya Borrow Pit Canal TMDL for Sulfate and Salinity/Total Dissolved Solids (EPA 2000b).

3.0 CALIBRATION OF WATER QUALITY MODEL

3.1 Model Setup

In order to evaluate the linkage between pollutant sources and water quality, a computer simulation model was used. The model used for these TMDLs was LA-QUAL (version 3.02), which was selected because it includes the relevant physical, chemical, and biological processes and it has been used successfully in the past for other TMDLs in Louisiana. The LA-QUAL model was set up to simulate organic nitrogen, ammonia nitrogen, ultimate carbonaceous biochemical oxygen demand (CBODu), and DO. Phosphorus and algae were not simulated because algae do not appear to have significant impacts on DO in these subsegments.

A vector diagram of the model is shown in Appendix C. The Borrow Pit Canal was divided into 3 reaches to simulate different portions of the canal with different widths and depths. The only tributary inflow that was simulated was Bayou Portage, which flows into the Borrow Pit Canal near the downstream end of subsegment 060211. Many other canals and ditches are connected to the Borrow Pit Canal, but they were assumed to contribute a negligible amount of flow to the Borrow Pit Canal during critical conditions (based on their relatively small drainage areas). As mentioned in Section 2.3.1, no point source discharges were explicitly included in the model.

3.2 Calibration Period

An intensive field survey was not performed for the study area due to schedule and budget limitations. A synoptic survey of the study area was performed by FTN in September 2000, but only limited data were collected during that survey. The only historical period for which water quality data were collected was the June through December 1998 period when LDEQ collected their assessment data. The LDEQ station for subsegment 06011 is Station 0671.

The water quality data for this period were retrieved from the LDEQ website. These data are listed in tabular form in Appendix D and the temperature and DO are plotted in Appendix D.

The two conditions that usually characterize critical periods for DO are high temperatures and low flows. High temperatures decrease DO saturation values and increase rates for oxygen demanding processes (BOD decay, nitrification, and sediment oxygen demand (SOD)). In most systems, low flows cause reaeration rates to be lower. The purpose of selecting a critical period for calibration is so that the model will be calibrated as accurately as possible for making projection simulations for critical conditions.

Based on the historical LDEQ data, the calibration period was selected as September 2 to October 7, 1998 (Julian day 245 to 280). This period represented the most critical period for DO. The calibration target (i.e., the concentrations to which the model was calibrated) for each parameter was set to the average of the concentrations measured during the calibration period. The LDEQ ambient monitoring data included DO, total organic carbon (TOC), and total Kjeldahl nitrogen (TKN), but not $CBOD_5$, organic nitrogen, or ammonia nitrogen. Therefore, CBODu was estimated from TOC, and organic nitrogen and ammonia nitrogen were estimated from TKN. Relationships between these parameters were developed using data from the FTN synoptic survey in September 2000 and data from LDEQ's long term BOD analyses during 2000. The mean ratio of TOC to $CBOD_5$ from the FTN synoptic survey data was 6.0 and the median ratio of CBODu to CBOD5 from the LDEQ long term BOD data was 4.5. Combining these ratios yielded the following relationship that was used to develop model inputs:

CBODu = 0.75 * TOC

The median ratio of ammonia nitrogen to TKN from the FTN synoptic survey data was 0.17. This values was similar to the median ratio of ammonia nitrogen to TKN from the LDEQ data. The organic nitrogen was then determined as TKN minus ammonia nitrogen. This yielded the following relationships that were used to develop model inputs:

Ammonia nitrogen = 0.17 * TKN
Organic nitrogen = 0.83 * TKN

3.3 Temperature Correction of Kinetics (Data Type 4)

The temperature correction factors used in the model were consistent with the Louisiana Technical Procedures Manual (the "LTP"; LDEQ 2000b). These correction factors were:

• Correction for BOD decay:	1.047 (value in LTP is same as model default)
• Correction for SOD:	1.065 (value in LTP is same as model default)
• Correction for ammonia N decay:	1.070 (specified in Data Group 4)
• Correction for organic N decay:	1.020 (not specified in LTP; model default used)
• Correction for reaeration:	automatically calculated by the model

3.4 Hydraulics (Data Type 9)

The hydraulics were specified in the input for the LA-QUAL model using the power functions (width = a * Q^b + c and depth = d * Q^e + f). Under low flow conditions, the water levels in the Borrow Pit Canal were assumed to be relatively constant (i.e., independent of small changes in flow rate) based on the low gradient of the canal and field observations. Therefore, the system was modeled with constant depth and width. This was specified in the model by setting the coefficients and exponents as follows (values for each reach are shown in Appendix E):

- width coefficient (a) = 0.0
- width exponent (b) = 0.0
- width constant (c) = width
- depth coefficient (d) = 0.0
- depth exponent (e) = 0.0
- depth constant (f) = depth

Widths and depths were estimated primarily from September 2000 field data and digital ortho quarter quad maps.

3.5 Initial Conditions (Data Type 11)

The primary parameter that was specified in the initial conditions for LA-QUAL was the temperature for each reach (because temperature was not being simulated). The temperature for all three reaches was set to the average of the measured values at LDEQ station 0671 during the calibration period. The input data and sources are shown in Appendix E.

For other constituents not being simulated, the initial concentrations were set to zero; otherwise, the model would have assumed a fixed concentration of those constituents and the model would have included the effects of the unmodeled constituents on the modeled constituents (e.g., the effects of algae on DO).

3.6 Water Quality Kinetics (Data Types 12-13)

Kinetic rates used in LA-QUAL include reaeration rates, SOD, CBOD decay rates, nitrification rates, and mineralization rates (organic nitrogen decay). The values used in the model input are shown in Appendix E.

For reaeration, the surface transfer coefficient (K_L) was specified for each reach (option 20 in the model). Under low flow conditions, reaeration equations such as the O'Connor Dobbins equation yield reaeration coefficients that are lower than the minimum values specified in the LTP (0.7 m/day divided by depth). Also, the subsegment was considered wide enough that wind-aided reaeration might be significant. Therefore, a wind-aided surface transfer coefficient was calculated using the same methodology as used in the Mermentau River model (LDEQ 1999) and in the Lake Fausse Pointe/Dauterive Lake model (FTN 2000). Daily wind speeds from the Lafayette airport were averaged for the calibration period was corrected to a height of 0.1 m, and then used to calculate a wind-aided surface transfer coefficient of 1.11 m/day. The value of 1.11 m/day was specified in the model for all reaches.

The SOD rates were developed through iteration in the calibration. The SOD rate for each reach was adjusted so that predicted DO concentrations were similar to the calibration target value. The CBOD decay rate was set to 0.10/day based on LDEQ's guidance for uncalibrated modeling of the Mermentau and Vermilion-Teche basins (LDEQ 2000c) and information in the "Rates, Constants, and Kinetics" publication (EPA 1985).

Mineralization rates (organic nitrogen decay) in the model were set to 0.02/day for all reaches. This value was based on information in the "Rates, Constants, and Kinetics" publication (EPA 1985). Nitrification rates were set to 0.10/day for all reaches, which is consistent with guidance in the LTP based on stream depth. The combination of these rates is consistent with

LDEQ's guidance for uncalibrated modeling of the Mermentau and Vermilion-Teche basins (LDEQ 2000c). The LDEQ guidance specified a default rate of 0.05/day for nitrogenous biochemical oxygen demand (NBOD) decay, which represents the combination of mineralization and nitrification.

3.7 Nonpoint Source Loads (Data Type 19)

The nonpoint source (NPS) loads that are specified in the model can be most easily understood as resuspended load from the bottom sediments and are modeled as SOD, benthic ammonia source rates, CBOD loads, and organic nitrogen loads. The SOD (specified in data type 12), the benthic ammonia source rates (specified in data type 13), and the mass loads of organic nitrogen and CBODu (specified in data type 19) were all treated as calibration parameters; their values were adjusted until the model output was similar to the calibration target values. The procedures used for calibrating the model are discussed in Section 3.10. The values used as model input are shown in Appendix E.

3.8 Headwater and Tributary Flow Rates (Data Types 20 and 24)

The only USGS flow gage for the Borrow Pit Canal was a gage that was discontinued in 1975. Therefore, no USGS flow data were available for the calibration period. The current system for providing regulated flow into the Borrow Pit Canal was completed in 1983. Although the Teche-Vermilion Freshwater District operates this system, they do not measure flows into the Borrow Pit Canal. The best estimate of the headwater inflow to the Borrow Pit Canal during the calibration period was considered to be the value specified in the flow distribution tables of the Vermilion-Teche water control plan (USACE 1998). These tables, which are shown in Appendix E, list a flow of 100 cfs (2.83 m^3/sec) for the Borrow Pit Canal below the Bayou Courtableau – Borrow Pit control structure. This value (2.83 m3/sec) was used for the model input.

For Bayou Portage, the inflow was estimated based on the areal flow (i.e., cfs per square mile) that was calculated using the average flow during the calibration period from Bayou Courtableau at Washington (USGS gage number 07382500). The areal flow was multiplied by the Bayou Portage drainage area (USGS 1971). Flow calculations and values used as model input are shown in Appendix E.

3.9 Headwater and Tributary Water Quality (Data Types 21 and 25)

Concentrations of DO, CBODu, organic nitrogen, and ammonia nitrogen were specified in the model for the headwater and tributary inflows. Because water quality data for the headwater inflow were not available for the calibration period, water quality measurements from the FTN 2000 synoptic survey at station 671-3 were used for headwater quality. For Bayou Portage, the average of LDEQ water quality measurements at station 671-1 during the calibration period were used. The values used as model input are shown in Appendix E.

3.10 Calibration Methodology

The model was calibrated by adjusting 4 input parameters: organic nitrogen loads, benthic ammonia source rates, CBOD mass loads, and SOD. First, the organic nitrogen loads were adjusted until the predicted organic nitrogen concentrations were similar to the observed concentrations. Organic nitrogen was calibrated first because none of the other state variables (DO, CBOD, ammonia nitrogen) will affect the organic nitrogen concentrations. Next, the benthic ammonia source rates were adjusted until the predicted ammonia nitrogen concentrations were similar to the observed concentrations. Finally, SOD was adjusted until the predicted DO concentrations were similar to the observed concentrations.

3.11 Model Results for Calibration

Plots of predicted and observed water quality for the calibration period are presented in Appendix F and a printout of the LA-QUAL output file is included as Appendix G. The calibration was considered to be acceptable based on the amount of data that were available.

4.0 WATER QUALITY MODEL PROJECTION

EPA's regulations at 40 CFR 130.7 require the determination of TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. Therefore, the calibrated model was used to project water quality for critical conditions. The identification of critical conditions and the model input data used for critical conditions are discussed below.

4.1 Identification of Critical Conditions

Section 303(d) of the Federal Clean Water Act and EPA's regulations at 40 CFR 130.7 both require the consideration of seasonal variation of conditions affecting the constituent of concern and the inclusion of a MOS in the development of a TMDL. For the TMDL in this report, analyses of LDEQ long-term ambient data were used to determine critical seasonal conditions. A combination of implicit and explicit MOS was used in developing the projection model.

Critical conditions for DO have been determined for the Vermilion-Teche basin in previous TMDL studies. The analyses concluded that the critical conditions for stream DO concentrations occur during periods with negligible nonpoint runoff, low stream flow, and high stream temperature.

When the rainfall runoff (and nonpoint loading) and stream flow are high, turbulence is higher due to the higher flow and the stream temperature is lowered by the cooler precipitation and runoff. In addition, runoff coefficients are higher in cooler weather due to reduced evaporation and evapotranspiration, so that the high flow periods of the year tend to be the cooler periods. DO saturation values are, of course, much higher when water temperatures are cooler, but BOD decay rates are much lower. For these reasons, periods of high loading are periods of higher reaeration and DO but not necessarily periods of high BOD decay.

LDEQ interprets this phenomenon in its TMDL modeling by assuming that the annual nonpoint loading, rather than loading for any particular day, is responsible for the accumulated benthic blanket of the stream, which is, in turn, expressed as SOD and/or resuspended BOD in the model. This accumulated loading has its greatest impact on the stream during periods of higher temperature and lower flow.

According to the LTP, critical summer conditions in DO TMDL projection modeling are simulated by using the annual 7Q10 flow or 0.1 cfs, whichever is higher, for all headwaters, and 90th percentile temperature for the summer season. Model loading is from point sources, perennial tributaries, SOD, and resuspension of sediments. In addition, all point sources are assumed to be discharging at design capacity.

In reality, the highest temperatures occur in July through August, the lowest stream flows occur in October through November, and the maximum point source discharge occurs following a significant rainfall, i.e., high-flow conditions. The combination of these conditions plus the impact of other conservative assumptions regarding rates and loadings yields an implicit MOS that is not quantified. Over and above this implicit MOS, an explicit MOS of 20% for point sources and 10% for NPS was incorporated into the TMDL in this report to account for future growth and model uncertainty.

4.2 Temperature Inputs

The LTP (LDEQ 2000b) specified that the critical temperature should be determined by calculating the 90th percentile seasonal temperature for the waterbody being modeled. Because the LDEQ station in this subsegment has only 6 months of data, LDEQ data from another subsegment were used for this analysis. In the Bayou Courtableau TMDL (LDEQ 2000d), long term temperature data from Bayou Courtableau at Washington, LA (LDEQ station 0102) were used to calculate a 90th percentile summer temperature of 28.3ºC. This value was specified in data type 11 in the model input and is shown in Appendix H.

Because the subsegment has a year round standard for DO, a winter projection simulation was not performed. As discussed above, the most critical time of year for meeting a constant DO standard is the period of high temperatures and low flows (i.e., summer).

4.3 Headwater and Tributary Inputs

The inputs for the headwaters and tributaries for the projection simulation were based on guidance in the LTP. According to the LTP, the critical flow rates for summer should be set to either the 7Q10 flow or 0.1 cfs, whichever is higher. Also, the LTP specifies that the DO concentration for headwater and tributary inflows should be set to 90% saturation at the critical temperature. The values used as model input in the projection simulation are shown in Appendix H.

As discussed in Section 3.8, there are no recent flow data for the Borrow Pit Canal. For determining critical conditions, it was assumed that the Teche-Vermilion Freshwater District would maintain the flow of 100 cfs that is specified in the water control plan (USACE 1998). Therefore, the headwater flow for the projection was set to 100 cfs (2.83 m^3/sec).

The 7Q10 flow for Bayou Portage was estimated based on the published 7Q10 flow for USGS station 073830 – Chatlin Lake Canal near Lecompte, LA (Lee et al 1997). An areal 7Q10 flow was calculated by dividing the 7Q10 by the drainage area for the station. The Bayou Portage 7Q10 flow was then calculated by multiplying the areal 7Q10 flow by the Bayou Portage drainage area. The calculated 7Q10 was greater than 0.1 cfs. These calculations are included in Appendix H.

DO was the only water quality parameter that was modified for the headwater and tributary inflows in the projection model. Other input water quality concentrations used in the calibration were assumed to be representative of critical conditions and were therefore used in the projection model.

4.4 Nonpoint Source Loads

Because the initial projection simulation was showing low DO values in all of the reaches, the NPS loadings were reduced until all of the predicted DO values were equal to or greater than the water quality standard of 5.0 mg/L. Within each reach, the same percent reduction was applied to all components of the NPS loads (SOD, benthic ammonia source rates, and mass loads of CBODu and ammonia nitrogen). The values used as model input in the projection simulation are shown in Appendix H.

4.5 Other Inputs

The only model inputs that were changed from the calibration to the projection simulation were the inputs discussed above in Sections 4.2 through 4.6. All of the other model inputs (e.g., hydraulic and dispersion coefficients, decay rates, reaeration rates, etc.) were unchanged from the calibration simulation.

4.6 Model Results for Projection

Plots of predicted water quality for the projection are presented in Appendix I and a printout of the LA-QUAL output file is included as Appendix J.

Nonpoint source load reductions of 15% to 25% were required in all three reaches to bring predicted DO concentrations to at least 5.0 mg/L (see Appendix H). These percentage reductions for NPS loads represent percentages of the entire NPS loading, not percentages of the manmade NPS loading. The NPS loads in this report were not divided between natural and manmade because it would be difficult to estimate natural NPS loads for the Borrow Pit Canal.

5.0 TMDL CALCULATIONS

5.1 DO TMDL

TMDLs for the oxygen demanding constituents (CBODu, ammonia nitrogen, organic nitrogen, and SOD) were calculated based on the results of the projection simulation. A summary of the loads for subsegment 060211 is presented in Table 5.1. The TMDL calculations are shown in Appendix K.

Table 5.1. DO TMDL for Subsegment 060211 (WABPL Borrow Pit Canal).

	Oxygen demand (kg/day) from:				Total oxygen demand (kg/day)
	CBODu	Organic N	Ammonia N	SOD	
WLA for minor point sources	34	NA	27	NA	61
MOS for all point sources	9	0	7	NA	15
LA for NPS	5,061	1,106	216	4,323	10,705
MOS for NPS	562	123	24	480	1,190
Total maximum daily load	5,665	1,229	273	4,804	11,971

Oxygen demand from organic nitrogen and ammonia nitrogen was calculated as 4.33 times the load. The value of 4.33 is the same ratio of oxygen demand to nitrogen that is used by the LA-QUAL model. For the SOD loads, a temperature correction factor was included in the calculations (in order to be consistent with LDEQ procedures).

The WLAs for minor point sources represent the loads from small oxygen demanding discharges that were not explicitly modeled. In general, these WLAs were based on current permit limits with no reductions. For discharges with no permit limits for ammonia nitrogen, effluent concentrations for ammonia nitrogen were assumed based on the BOD_5 permit limits and typical combinations of BOD_5 and ammonia nitrogen listed in the LTP (LDEQ 2000b).

Because the WLAs for minor point sources represented loads that were not simulated in the model, these loads were added to the model loads for the TMDL. The MOS for minor point sources was set to 20% of the total minor point source loading. The LA for NPS was calculated as 90% of the NPS load simulated in the model. The other 10% of the NPS load simulated in the model was designated as an explicit MOS.

5.2 Summary of NPS Reductions and Point Source Upgrades

In summary, the projection modeling used to develop the TMDL above showed that NPS loads need to be reduced by 15% - 25% to achieve the DO standard in the Borrow Pit Canal. No point source upgrades are recommended because there are no point source discharges that have a significant impact on DO in the Borrow Pit Canal.

5.3 Seasonal Variation

As discussed in Section 4.1, critical conditions for DO in Louisiana waterbodies have been determined to be when there is negligible nonpoint runoff and low stream flow combined with high water temperatures. In addition, the models account for loadings that occur at higher flows by modeling sediment oxygen demand. Oxygen demanding pollutants that enter the waterbodies during higher flows settle to the bottom and then exert the greatest oxygen demand during the high temperature seasons.

5.4 Margin of Safety

The MOS accounts for any lack of knowledge or uncertainty concerning the relationship between load allocations and water quality. As discussed in Section 4.1, the highest temperatures occur in July through August, the lowest stream flows occur in October through November, and the maximum point source discharge occurs following a significant rainfall, i.e., high-flow conditions. The combination of these conditions, in addition to other conservative assumptions regarding rates and loadings, yields an implicit MOS that is not quantified. In addition to the implicit MOS, the TMDL in this report included explicit margins of safety of 20% for point source loads and 10% for NPS loads.

6.0 SENSITIVITY ANALYSES

All modeling studies necessarily involve uncertainty and some degree of approximation. It is therefore of value to consider the sensitivity of the model output to changes in model coefficients, and in the hypothesized relationships among the parameters of the model. The sensitivity analyses were performed by allowing the LA-QUAL model to vary one input parameter at a time while holding all other parameters to their original value. The projection simulation was used as the baseline for the sensitivity analysis. The percent change of the model's minimum DO projections to each parameter is presented in Table 6.1. Each parameter was varied by ±30%, except for temperature, which was varied ±2ºC.

Values reported in Table 6.1 are sorted by percentage variation of minimum DO from smallest percentage variation to largest. Reaeration was the parameter to which DO was most sensitive (12% to 24%). The model results were slightly sensitive to SOD, temperature, velocity, depth, and BOD decay rate with variations in predicted DO ranging from 2% to 8%. The model was not sensitive to headwater flow, organic nitrogen or ammonia decay rates, or wasteload water quality.

Table 6.1. Summary of results of sensitivity analyses.

Input Parameter	Parameter Change	Predicted minimum DO (mg/L)	Percent Change in Predicted DO (%)
Baseline	-	5.0	N/A
BOD decay rate	-30%	5.0	<1
Depth	-30%	5.0	<1
Headwater flow	+30%	5.0	<1
Headwater flow	-30%	5.0	<1
NH3 decay rate	+30%	5.0	<1
NH3 decay rate	-30%	5.0	<1
Organic N decay rate	-30%	5.0	<1
Organic N decay rate	+30%	5.0	<1
Waste Load BOD	-30%	5.0	<1
Waste Load BOD	+30%	5.0	<1
Waste Load DO	+30%	5.0	<1
Waste Load DO	-30%	5.0	<1
Waste Load flow	+30%	5.0	<1
Waste Load flow	-30%	5.0	<1
Waste Load NH3	+30%	5.0	<1
Waste Load NH3	-30%	5.0	<1
Waste Load Organic N	-30%	5.0	<1
Waste Load Organic N	+30%	5.0	<1
Velocity	-30%	5.0	2
BOD decay rate	+30%	5.0	4
Depth	+30%	5.1	6
SOD	-30%	4.8	6
Velocity	+30%	4.7	6
Initial Temperature	-2ºC	5.4	8
Initial Temperature	+2ºC	4.6	8
SOD	+30%	4.6	8
Reaeration	+30%	5.6	12
Reaeration	-30%	3.8	24

7.0 OTHER RELEVANT INFORMATION

This TMDL has been developed to be consistent with the antidegradation policy in the LDEQ water quality standards (LAC 33:IX.1109.A).

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water-monitoring program is used to develop the state's biennial 305(b) report (Water Quality Inventory) and the 303(d) List of impaired waters. This information is also utilized in establishing priorities for the LDEQ NPS program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) List. The sampling schedule for the first five-year cycle is shown below. The Mermentau and Vermilion-Teche Basins will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 – Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

8.0 PUBLIC PARTICIPATION

When EPA establishes a TMDL, 40 CFR §130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999 Court Order, this TMDL was prepared under contract to EPA. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information, and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. Responses to these comments and additional information are included in Appendix L. EPA has transmitted this revised TMDL to the Court and to LDEQ for incorporation into LDEQ's current water quality management plan.

9.0 REFERENCES

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APPENDICES A THROUGH K ARE AVAILABLE FROM EPA UPON REQUEST

APPENDIX L

Responses to Comments

COMMENTS AND RESPONSES
WEST ATCHAFALAYA BASIN PROTECTION LEVEE BORROW PIT CANAL
TMDL FOR DO
April 19, 2002

EPA appreciates all comments concerning these TMDLs. Comments that were received are shown below with EPA responses inserted in a different font.

GENERAL COMMENTS FROM LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY (LDEQ) (some of these comments may not apply to this report):

In view of LDEQ's TMDL development schedule and the rapidly approaching deadline, LDEQ has made a limited review of the TMDLs published by EPA on October 15, 2001. LDEQ expects to make a more detailed review on at least some of these TMDLs after the first of the year. In the future, LDEQ requests that EPA provide hard copies of the TMDLs and Appendices for LDEQ review. Several electronic files required software which is not used by LDEQ thus making it impossible to review some portions of several TMDLs. Hard copies will insure that the complete official document is being reviewed and will eliminate the time required for LDEQ to try to put together the document from electronic files. In general, LDEQ found these TMDLs to be unacceptable, based on inadequate data and not implementable.

Federal Register Notice: Volume 66, Number 199, pages 52403 - 52404 (10/15/2001)

A. Vermilion River Cutoff DO and Nutrients .pdf
B. Bayou Chene DO .pdf
C. Bayou du Portage DO .pdf
D. Bayou Mallet DO, Nutrients and Ammonia .pdf
E. Bayou Petite Anse DO and Nutrients .pdf
F. Bayou Tigre DO and Nutrients .pdf
G. Big Constance Lake and Mermentau Coastal Bays and Gulf Water TMDLs for DO and Nutrients .pdf
H. Charenton Drainage and Navigation Canal and West Cote Blanche Bay TMDLs for DO and Nutrients.pdf
I. Chatlin Lake Canal/Bayou Du Lac and Bayou Des Glaises Diversion Channel TMDLs for DO and Nutrients.pdf
J. Dugas Canal DO and Nutrients .pdf
K. Franklin Canal DO and Nutrients .pdf
L. Freshwater Bayou Canal DO and Nutrients .pdf
M. Irish Ditch/Big Bayou DO .pdf

N. Lake Arthur, Grand Lake, and Gulf Intracoastal Waterway TMDLs for DO, Nutrients, and Ammonia .pdf
O. Lake Peigneur DO and Nutrients .pdf
P. New Iberia Southern Drainage Canal DO and Nutrients .pdf
Q. Spanish Lake DO .pdf
R. Tete Bayou DO and Nutrients .pdf
S. Bayou Carron DO and Nutrients .pdf
T. West Atchafalaya Basin Protection Levee Borrow Pit Canal DO.pdf

1. Many of these TMDLs are based on models using historical water quality data gathered at a single location rather than survey data gathered at several sites spaced throughout the waterbody. Hydraulic information used was generally not taken at the same time as the water quality data used. The availability of only one water quality data site is not sufficient justification to simulate the subsegment using a one reach, one element model. Additional reaches and elements must be used to represent the subsegment and additional data must be obtained in order for these TMDLs to be valid. The recommended maximum limits cited in the LAQUAL User's Manual for element width and length have been grossly exceeded in many of the models. The spreadsheet calibration and projection graphs that were provided do not match the plots produced by the LA-QUAL model. Please explain why they do not match. The LAQUAL graphics for a few elements produces a graph that does not represent the model output. It's an anomaly of the graphics routine. The calibrations are inadequate due to the lack of a hydrologic calibration and the paucity of water quality data. The resulting TMDLs are invalid. LDEQ does not accept these TMDLs.

Response: The TMDLs were based on existing data plus information that could be obtained with available resources. Each model was developed using the most appropriate hydraulic information and water quality data that were available. The level of detail at which each subsegment was modeled was consistent with the amount of available data. Although having only one element in a model causes inaccuracies in the LAQUAL graphics, having only one element in a model does NOT cause errors in the tabular output (which is what the graphs in the reports are based on). Although LDEQ typically collects more data for model calibration than what was available for calibration of these models, EPA considers these model calibrations and the resulting TMDLs to be valid.

2. LDEQ does not consider any of these waters to be impaired due to nutrients or ammonia. LDEQ does not consider Vermilion River Cutoff (060803), Mermentau Coastal Bays and Gulf Water (050901), Charenton Drainage and Navigation Canal (060601), West Cote Blanche Bay (061001), Bayou Des Glaises Diversion channel (060207), Grand Lake (070701), Gulf Intracoastal Waterway (050702, Lake Peigneur (060909), New Iberia Southern Drainage Canal (060904) and West Atchafalaya Basin Protection Levee Borrow Pit Canal to be impaired by biochemical oxygen-demanding substances. Many of these waters simply have inappropriate

standards and criteria. The resources spent on developing these TMDLs could have been far more effectively and wisely spent on reviewing, approving, and assisting in the development of appropriate standards and criteria for these waters through the UAA process.

Response: TMDLs were developed for these subsegments based on the requirements of Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 and the suspected causes of impairment (organic enrichment/low DO, nutrients, or ammonia) for each subsegment in the EPA Modified Court Ordered 303(d) List.

3. Remove the reference and all references to the unpublished LDEQ document, "Defaults for Uncalibrated Modeling". This is not an acceptable reference and any defaults selected on this basis must be reevaluated and based on acceptable references. Some of the models must be redone because of inappropriately selected defaults. At this time, LDEQ has no plans to revise, complete or publish this document.

Response: The unpublished LDEQ document that is mentioned here was provided to EPA's contractor without any instructions not to use it. The model coefficients listed in that document appear to be reasonable and consistent with values used in other modeling studies in southern Louisiana.

4. The percent reduction of the nonpoint source load must not be reported as an overall average of the individual percent reduction applied to each reach. This approach does not insure that standards will be met in all reaches and will be difficult to implement. In consideration of future implementation plans, LDEQ does not vary the percent reduction required from reach to reach. LDEQ uses a uniform percent reduction within a watershed unless there are unique conditions, such as a general change in landuse, that dictate a further breakdown. These unique conditions must be adequately documented in the report in order to facilitate future implementation plans. Specifying type of land use is helpful in defining nonpoint loading. LDEQ requests a calculation sheet of the NPS reduction percentages and asks that language be added to the report describing the calculation process.

Response: EPA appreciates this comment but believes that an average percent reduction is acceptable. EPA will consider this in future development of TMDLs in Louisiana.

In the lower Mermentau and Vermilion River Basins, much of the nonpoint loading affecting some of these subsegments and adding to their benthic blanket is coming from the tributaries feeding them. Many of the headwater tributaries have recent TMDL's that require dramatic percentage reductions to the nonpoint contributions. By implementing the reductions to nonpoint loads upstream, the current problems in these lower subsegments will be reduced.

Response: EPA recognizes that TMDLs have been developed upstream of several of these subsegments. Implementing upstream reductions in nonpoint loads should require much less reduction of loadings from within these subsegments. The required percent reductions for these subsegments were not intended to be in addition to upstream reductions.

5. The percentage reductions listed were not calculated based on the written procedure described in several TMDLs. These values did not take the MOS into consideration. It is also LDEQ's policy to make a no-man-made load projection run which will estimate the natural background loads. The contractor should include a no-man-made load projection run in each TMDL report.

Response: The percent reductions were calculated by subtracting the projection input value from the calibration input value and then dividing by the calibration input value. This procedure is slightly different than what LDEQ uses but still provides percent reductions that are useful.

6. CBODu and NH3-N were estimated from surrogate parameters rather than actual measured data for most of the TMDLs. Based on the measured data from the last two years of LDEQ water quality surveys, LDEQ objects to the correlation of TOC to CBOD and NH3-N to TKN, unless these correlations are taken from water quality data on the modeled waterbody. Our studies have shown only a moderate correlation between these two parameters within the same waterbody, however when this correlation was attempted across waterbodies extreme variability was seen and the correlation was not judged valid. It is possible that a combination of surrogates will obtain a better correlation, such as TOC along with color, turbidity, pH, etc. LDEQ is currently researching these options.

Response: EPA agrees that it would be ideal to have data collected from the modeled waterbody for relating TOC to CBOD and NH3-N to TKN. However, for these subsegments, there was insufficient data from which these relationships could be developed.

7. LDEQ takes exception to the equating of COD to CBODu in some of the TMDLs. There is no data to support this assumption. No direct correlation has been drawn between these two parameters. The only correlations that have been found are variable and dependant on the type of discharge. LDEQ requests that facilities with only COD limits be removed from the WLA load calculations.

Response: EPA agrees that COD is not an ideal indicator of CBODu. However, EPA believes that most effluents that exert significant COD are likely to exert some oxygen demand in natural waterbodies and therefore the discharges with COD limits should be included in the TMDLs.

8. CBODU and Org-N settling rates were not used. This is not justifiable in areas dominated by agricultural activities and is poor practice for TMDLs on Louisiana waters. The models must be revised to include settling rates.

Response: Without the use of settling rates, all of the pollutant loading remains in the water column where it can consume oxygen. Depending on the model settings for conversion of settled pollutant loading to SOD, the model can be more conservative without settling rates. Other applications of water quality models for TMDLs on southern Louisiana waterbodies have not used settling rates and have been approved by LDEQ.

9. The TMDLs should be for biochemical oxygen-demanding substances instead of DO. DO is an indicator of the impact of biochemical oxygen demanding load, hydrologic modifications, excessive algae blooms, etc.

Response: The TMDLs in Section 5 of each report are already expressed in terms of oxygen demand.

10. Nitrification inhibition option number 2 is valid for Louisiana's waterbodies. Various studies have shown that Louisiana does not have a buildup of NH3-N in its waterbodies. If option 1 was needed for a proper calibration then that should be stated as such.

Response: The nitrification inhibition option was set based on algorithms in other widely used water quality models. Option 1 has been used in other water quality modeling applications for TMDLs on southern Louisiana waterbodies that have been approved by LDEQ.

11. A winter projection model was not developed for most of the TMDLs. Winter projection models must be developed to address seasonality requirements of the Clean Water Act. Where point sources have seasonally variable effluent limitations or such seasonal variations are proposed, a winter projection model is required to show that standards are met year-round.

Response: As discussed in Section 4.2 of each report, summer is the most critical season for meeting the year round standard for DO for this subsegment. Therefore, the summer simulation satisfies the seasonality requirements of the Clean Water Act. Performing additional simulations to evaluate permit limits that are seasonal or hydrograph controlled releases was not required for developing these TMDLs and can be done by LDEQ or by permittees.

12. There was no documentation (LA-QUAL plots) to indicate that the model was calibrated to all hydrologic parameters (i.e. flow, width, depth, time of travel, velocity, chloride balance, etc.). Apparently flow balances were performed, however a flow balance is not a hydrologic calibration. Most of the models must be recalibrated with adequate hydrologic data. Calibration plots for all of the hydrologic parameters must be provided in the appendices.

Response: The values of depth, width, and flow in each model were estimated based upon the most appropriate available information. Hydraulic calibration of each model was not possible due to a lack of data.

13. The calibration and projection plots for dissolved oxygen must be provided in the body of the reports. Additional projection plots for CBODU, NH3-N, and Org-N must be provided in the appendices.

Response: The placement and number of plots in the draft reports are acceptable.

14. The calibration simulation must be used as the baseline for the sensitivity analysis, not the projection simulation. LDEQ requests that all TMDLs be revised in this regard.

Response: The sensitivity analysis can be developed using either the calibration or the projection as a baseline. EPA will consider this in future development of TMDLs in Louisiana.

15. A list of all point source dischargers must be provided in the body of the reports. Only dischargers with flows that reach the named waterbody should be included in the TMDLs.

In several TMDLs, a default 0.001 MGD flow rate was assigned to dischargers where a flow rate was not available. This practice is unacceptable to LDEQ. This default flow rate is extremely low (LDEQ would typically use 0.005 MGD as a minimum) and could strictly limit these dischargers' allowable permit loads when their permits are renewed. Additional research should be done to determine the facility type and anticipated flow rates of these facilities.

Response: The placement of the list of point source dischargers in the draft reports is acceptable. The dischargers with no flow rate information are believed to have very small flow rates representing a very small portion of the total TMDLs. The actual flow rate for each facility can be determined by LDEQ when the facility's permit is being renewed.

16. LDEQ does not agree with the minor point sources loads being subtracted from the NPS load as was done in several of the TMDLs. The pollutant loads being addressed are non-conservative loads. Many of these dischargers are located on small tributaries to the 303(d) waterbody which have recovered prior to entering into that system. Thus they are not contributing to the pollutant loads in the impaired waterbody. LDEQ's current procedure is to add these loads to the WLA portion of the TMDL.

Response: In the reports for which this comment is applicable, the TMDL calculations have been revised so that these loads are added to the WLA portion of the TMDL (same as LDEQ's procedure). For most of the draft reports, the TMDL calculations already used LDEQ's procedure of adding the minor point sources to the modeled loads.

17. Proper justification must be provided when using a nonpoint source margin of safety value other than the typical LDEQ value of 20%.

Response: The nonpoint margin of safety (MOS) was set to 10% based on other TMDLS on southern Louisiana waterbodies that have either been developed by LDEQ or approved by LDEQ. Eleven TMDL reports from LDEQ's website were reviewed to examine the explicit MOS for nonpoint sources. All 11 of these TMDLs were for oxygen demanding substances in the Mermentau or Vermilion-Teche basins. The explicit MOS for nonpoint sources was set to 20% for 2 reports, 10% for 3 reports, and 0% for 6 reports. Therefore, the value of 10% was considered to be a typical value that did not need special justification.

18. LDEQ has major concerns relating to the use of a one dimensional steady state model in coastal bays, lakes and estuaries. These systems are typically dominated by tides and winds and do not behave like riverine systems. LAQUAL can be used to simulate estuarine systems with riverine characteristics and some tidal influences; however to use it in these applications exceeds the model's recommended input limitations and appears to produce a meaningless output. Also the systems' unique hydrological characteristics do not adapt well to LAQUAL's one-dimensional capabilities. A multi-dimensional model such as WASP should be used for these waters. While a dynamic model would be preferred, a steady-state multi-dimensional model would be acceptable if it adequately addresses tidal influences. LDEQ objects to the use of LAQUAL in determining TMDLs for coastal bays, lakes and estuaries.

Response: A one dimensional steady state model such as LAQUAL was considered to be appropriate for all of these subsegments based on the amount of data that were available. Proper application of a multi-dimensional model or a dynamic model would require much more data and is simply not necessary for these waterbodies. For large, wide waterbodies, WASP will yield the same results as LAQUAL if the configuration of elements and model coefficients are the same between the two models.

19. The report uses the term synoptic survey multiple times. Please describe in detail what area this survey encompassed as well as site locations and what parameters were tested. Also, the raw data from this survey must be included in the appendices as support for the model inputs and calculations.

Response: A description of the synoptic survey and a summary of the data have been added to the appendices for each report in which those data are used.

20. In many of the calibration models the average water quality data from several LDEQ stations were used. It has been LDEQ's experience that a better calibration can be accomplished by using a single day's water quality and flow data. The additional daily values could then be used to perform multiple verifications of the model parameters before proceeding to the projection

stage. The flow data should be collected at the same time as the water quality data in order for the model to be valid.

Response: The models were calibrated to averages over multiple sampling events to minimize the effects of any single field measurement that might be of questionable quality or indicative of conditions that may have lasted only a very short time. For large systems with long residence times, using only a single snapshot of water quality data is often not representative of steady state conditions for that system.

21. Grammatical errors and misspelled words were found in these reports.

Response: The reports have been reviewed for grammar and spelling.

22. There does not appear to be any significant anthropogenic source of nutrients from agriculture, silviculture, aquaculture or urban runoff in many of these subsegments. Therefore, any occurrence of low DO is almost certainly natural. As a result, a UAA for the area is necessary to reset the DO standard. A TMDL is unwarranted for these subsegments,and LDEQ takes exception to EPA generating TMDLs which are impossible to implement.

Response: EPA is required to generate these TMDLs based on the Modified Court Ordered 303(d) List and the requirements of Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7.

23. LDEQ's nutrient standard is based on total phosphorus (TP) and total nitrogen (TN), not total inorganic nitrogen (TIN). Since phosphorus is not the limiting constituent in Louisiana, the nutrient allocations must be in terms of TN and only TN.

Response: LDEQ's nutrient standard (LAC 33:IX.1113.B.8) does not specify that nitrogen to phosphorus ratios should be based on total nitrogen. However, EPA will consider this in future development of TMDLs in Louisiana.

In the coastal areas, the nitrogen to phosphorus ratio used was based on freshwater streams and is not applicable to brackish Gulf waters. LDEQ takes exception to the calculation of a TMDL based on TN/TP ratios derived from waterbodies other than the modeled waterbody. It is LDEQ's experience that the natural allowable TN/TP ratio is waterbody-specific and can vary dramatically between streams.

Response: EPA agrees that it would be ideal to have a large database of nitrogen to phosphorus ratios for each waterbody. However, because these subsegments have only limited nutrient data, the previously developed nitrogen to phosphorus ratio that was used in the draft reports is considered acceptable.

LDEQ has not adopted the EPA recommended ammonia criteria (1999) and takes exception to its use in this TMDL. In general, LDEQ does not accept EPA's use of national guidance for TMDL endpoints. The nationally recommended criteria do not consider regional or site-specific conditions or species and may be inappropriately over protective or under protective. No ammonia nitrogen toxicity has been demonstrated or documented in any of the waterbodies in these TMDLs. The general criteria (in particular, LAC 33:IX.1113.B.5) require state waters be free from the effects of toxic substances.

Response: Ammonia TMDLs were developed for two subsegments based on the requirements of Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 and the fact that the Modified Court Ordered 303(d) List included ammonia as a suspected cause of impairment for those two subsegments. National guidance for ammonia toxicity was used in the absence of any numerical state water quality standards for ammonia.

24. The implicit margin-of-safety must not be quantified.

Response: The text of the reports has been revised to eliminate any quantification of the implicit margin of safety.

25. EXECUTIVE SUMMARIES: Add summary tables of the WLAs, LAs, and TMDLs showing the allocations and margins of safety.

Response: The summary tables of the WLAs, LAs, and TMDLs can be easily found in Section 5 of each report and do not need to be repeated in the executive summary.

26. Temperature Correction of Kinetics: A temperature correction factor was set for reaeration. It is LDEQ's standard practice to allow LAQUAL to calculate this factor. There is more guidance on this in the LAQUAL User's Manual.

Response: The temperature correction factor was reaeration was set to the value of 1.024 based on guidance in Section 3.3.8 of the LTP.

27. Water Quality Kinetics: The Louisiana reaeration equation was used on reaches that are outside the maximum depth that it was designed for. A more appropriate reaeration equation must be selected.

Response: The Louisiana equation yielded reaeration coefficients that appeared more reasonable than coefficients from other equations.

28. Water Quality standards and designated uses tables did not include the BAC (bacterial criteria) values.

Response: The water quality standards for bacteria are not relevant for these TMDLs.

29. The statement was made in the Initial Conditions paragraphs in several of the reports that temperature was specified because the temperature was not being simulated. The section then states, "For constituents not being simulated, the initial concentrations were set to zero …". Initial conditions provide a starting point for the iterative solution of modeled constituents. They also provide values for constituents that are needed as input but are not being simulated.

Response: EPA appreciates this comment.

30. Several reports describe the benthic ammonia source rate as a calibration parameter; however a review of the data type 13 calibration input section indicates a value of zero for this parameter, in all reaches.

Response: The benthic ammonia source rate was used as a calibration parameter; the value of that parameter that provided the best fit between predicted and observed values was zero.

31. Calibration, and Projection, Data type 27: A salinity value was set to zero in the boundary conditions for both the calibration and the projection models in several of the TMDLs. With this value set to zero the model will automatically adjust the values of the lowest reach's elements to the value set in the boundary conditions. Since most of the models were one-reach, one-element models, the model automatically set the element salinity to zero, thus calculating an inaccurate value for the DO saturation.

Response: The only models where salinity was set to zero in the downstream boundary conditions were those models where salinity was not considered high enough to have a significant impact on DO saturation.

32. It is not LDEQ's standard procedure to use a zero headwater flow. You may not have input a headwater flow, but the model did. Without a headwater flow the model would have crashed and not run. The model's programming allows for a 0.0000001 cms flow rate when the modeler has not input a headwater flow.

Response: Only two simulations (calibrations for Spanish Lake and Big Constance Lake) used a zero headwater flow. For all practical purposes, 0.0000001 m3/sec is the same as zero flow.

33. Hydraulics and Dispersion: The use of constant widths and depths requires proper justification.

Response: The widths and depths were justified in Section 3 of each report.

34. Several reports state that algae were not simulated because algae did not appear to have significant impacts. What was the evidence for this statement? Did the contractor have any Chlorophyll a measurements?

Response: This statement was based on general knowledge of the Mermentau and Vermilion-Teche basins as well as a limited amount of diurnal DO data collected in these basins.

SPECIFIC COMMENTS FROM LDEQ FOR BORROW PIT CANAL:

A. West Atchafalaya Basin Protection Levee Borrow Pit Canal DO.pdf

1. Executive Summary and Introduction: It is not clear which of the minor facilities in Appendix B are a part of the TMDL. It is not clear what is supposed to go into Appendix B. It is not clear (in spite of readme.txt) what is supposed to go into many of the appendices. A complete copy of the TMDL, including appendices, in PDF format would be much better. If that is beyond the current capability, a hard copy (including appendices) would suffice.

Response: EPA appreciates this comment and will take it into consideration for future TMDLs in Louisiana.

2. 2.3.1 Point Sources

   a. What is considered to be an "oxygen demanding parameter" for purposes of this TMDL? BOD only? BOD and TOC? How about COD?

Response: In this TMDL BOD, COD, ammonia nitrogen, and organic nitrogen are considered oxygen demanding parameters for point sources.

   b. Are Pat Huval's enterprises at Henderson dischargers in subsegment 060211?

Response: According to the list of NPDES dischargers that we have, yes Pat Huval Restaurant and Oyster Bar does discharge into this subsegment. However, no permit, DMRs, or permit application was available from LDEQ. Therefore the facility was not included in this TMDL.

3. 3.0 Calibration

   a. We have no idea why the model was calibrated to the 1998 DEQ data rather than the 2000 synoptic survey data. Synoptic survey DOs were all above 5.0 mg/l except for one 4.8.

Response: The 1998 LDEQ data was used because it better represents the low DO conditions that caused this subsegment to be included on the 303(d) List thus requiring a TMDL.

b. The model was calibrated to NH3-N and CBOD, neither of which were measured by DEQ in 1998, with no explanation of how that information was calculated and from what.

Response: Text describing how calibration target values for NH3-N and CBOD were calculated was added to Section 3.2.

4. 3.2 Calibration Period: Only 2 of the twelve assessment data points are below the DO criteria and one of those is 4.9. This waterbody is clearly not a priority waterbody for a TMDL.

Response: This subsegment was included on the February 2000 Modified Court Ordered 303(d) List for Louisiana with a priority 1 ranking. As a result, EPA is legally obligated to prepare a TMDL for this waterbody.

5. 3.5 Initial Conditions: This section states that temperature was specified because the temperature was not being simulated. This section then states that "For constituents not being simulated, the initial concentrations were set to zero …". Initial conditions provide a starting point for the iterative solution of modeled constituents. They also provide values for constituents that are needed as input but are not being simulated.

Response: Text edited for clarification.

6. 3.8 Headwater and Tributary Flow Rates: Full calculations must be presented. Unfortunately, Bayou Courtableau at Washington gets most of its flow from the upland region of the Kisatchie National Forest, and Bayou Portage drains agricultural lands that have very little relief and less perennial flow per square mile. A brief look for a more suitable site in the same area was not successful, however.

Response: Flow calculations for Bayou Portage included in Appendix E.

GENERAL COMMENTS FROM LOUISIANA STATE UNIVERSITY (LSU) AG CENTER
(some of these comments may not apply to this report):

Through this letter the Louisiana State University AgCenter would like to submit official comments on TMDLs for dissolved oxygen and nutrients associated allocations for waterbodies in:

- Vermilion River Cutoff
- Bayou Chene

- Bayou Petite Anse
- Bayou Tigre
- Big Constance Lake and Mermentau Coastal Bays and Gulf Water
- Charenton Drainage and Navigation Canal and West Cote Blanche Bay
- Chatlin Lake Canal/Bayou Du Lac and Bayou Des Glaises Diversion Channel
- Dugas Canal
- Franklin Canal
- Freshwater Bayou Canal
- Irish Ditch/Big Bayou
- Lake Arthur, Grand Lake, and Gulf Intracoastal Waterway
- Lake Peigneur
- New Iberia Southern Drainage Canal
- Spanish Lake
- Tete Bayou
- Bayou Carron
- West Atchafalaya Basin Protection Levee Borrow Pit Canal

The number of different TMDLs sent out for comment at the same time may overwhelm the public's ability to comment. With only 30 days to prepare and submit comments it is impossible for a qualified faculty member to review the supporting data in depth and attend to his(her) official responsibilities. I realize that the agency is under time constraints on completing these, but I earnestly request that more time per proposed TMDL be given in the future.

We must make several other general comments and objections that apply to most of the proposed TMDLs. In many cases the data used to calibrate the models for the stream segments was collected in the fall of 2000 near the end of a three year drought. Historic low flows were often commented on in the text of the TMDL. Low flows result in a biased estimate of the natural ability of the stream to reaerate and cleanse itself of pollutants. Low flows also enable the benthic blanket to accumulate and remain in place undisturbed causing overstatement of the benthic oxygen demand and the SOD which were in many cases the primary oxygen demand loads in the stream. While it is true that the high flows that come from storm events carry more organic and sediment loads into the stream, the high flow rates also scour material from the bottoms and move it on to a final deposit at the stream terminus. It was thus that most of Louisiana and all of our coastal areas were built. Prolonged drought conditions do not allow this natural cleansing to occur. Thus it is our belief that the part of the oxygen demand load attributed to benthic and sediments is overstated and that new data must be collected during normal rainfall conditions and the models re-calibrated.

Response: The Louisiana water quality standards are applicable during all flow conditions greater than the 7Q10. Because 7Q10 flow is frequently the most critical condition for maintaining the DO standard, it is desirable to collect field data for model calibration during times when the hydrology is as close as possible to 7Q10 conditions. It is believed that the flow conditions for these waterbodies may have been near 7Q10 conditions, but probably not lower than 7Q10 flows. Therefore, the summer-fall 1998 data is desirable for model calibration.

In far too many of the proposed TMDLs the phrase *"an intensive field survey was not conducted for the study area due to schedule and budget limitations"* was found. If municipalities, agriculture, and business entities are to be asked to make large commitments of funds, time and effort to resolve our water quality problems they deserve to have the benefit of a serious study of the problem. We request that all of the proposed TMDLs that contain this statement have this problem corrected and that TMDLs be prepared based on complete studies.

Response: There is no requirement for collecting a certain amount of data to make a TMDL valid. If additional data are collected in the future by LDEQ, other agencies, or local stakeholders, then those data can be evaluated at the time and the implementation of the TMDL can be altered as necessary. As outlined in the 1991 EPA document titled "Guidance for Water Quality-Based Decisions: The TMDL Process", developing and implementing TMDLs is a process and not a one-time event.

In several of the proposed TMDLs data was used that is 9 or 10 years old from studies on point source discharges. While the data is probably high quality it assumes that no change in the plant or its load have occurred in the last decade. This assumption may not be defensible. In the TMDLs where a treatment plant was included in the model the margin of error was calculated by using 125% of the design capacity. This assumes a plant will perform at the same level when it is operated in excess of its design load. This assumption is also questionable.

Response: For several subsegments, old data sets were used for calibration because they provided more extensive data than newer data sets. However, all of the projection runs simulated point source discharges based on the most recent information available. Simulating point source discharges at 125% of design flow is simply a way of incorporating an explicit margin of safety and does not assume that the facility can actually treat that much wastewater.

The standard for dissolved oxygen (DO) was held at 5 mg/L in some steams on a year round basis, even if it received or discharged into a stream with 5 mg/L winter and 2 or 3 mg/l summer standards. Other streams had a year DO oxygen standard of 4 mg/L. We strongly suggest that a review be made of the DO standards for all of the streams in south Louisiana that are shallow, sluggish, and subject to tidal influence and that uniform standards be set. In view of the remarks that achieving a DO of 5 mg/L was impossible in some of the streams that had little loading from human activities, we believe that the summer standard of 2 mg/L is much more applicable to these streams.

Response: The TMDLs are required to be developed for the existing DO standard, which is 5 mg/L year round for many of these subsegments. If the DO standard is revised in the future for any of these subsegments, the TMDL and implementation can be altered as necessary as part of the TMDL process.

Many of these TMDLs were drafted by an out of state contractor and do not appear to be as well researched as those drafted by LDEQ. Very little data was included in the contractor drafted TMDLs summaries as compared to the ones prepared by or in conjunction with LDEQ. Additionally, the bulk of the text appeared to be standard wording in all documents with short relevant inserts. We would request that if outside contractors be used in future TMDL assessments that they be held to the same standard of information inclusion that LDEQ provides. Stream diagrams and maps are often needed when reviewing descriptive text on stream location, tributary insert, and exact location.

Response: These TMDLs contain all the required components of a TMDL and the level of detail is considered acceptable. Because these TMDLs could not be funded at the same level as most of LDEQ's DO TMDLs, the analysis and documentation was not as extensive as most of LDEQ's DO TMDLs. However, some of the information that was mentioned in the comment (stream diagrams and maps) was included in the reports, but they were placed in the appendices (which were available from EPA upon request).